$$\begin{aligned} R_s[n,m] = \sum_{l=-\infty}^{\infty} \Bigg(& h_{\mathcal{U}}^{t}[n-lN] P h_{\mathcal{U}}[n+m-lN] \\ & + \sum_{r=0}^{R-1} h_{\mathcal{I}}^{t}[n-lN] C^{t}[r] P h_{\mathcal{U}}[n+m-(l-r)N] \\ & + \sum_{r=0}^{R-1} h_{\mathcal{U}}^{t}[n-lN] P C[r] h_{\mathcal{I}}[n+m-(l+r)N] \\ & + \sum_{r=0}^{R-1} \sum_{\rho=0}^{R-1} h_{\mathcal{I}}^{t}[n-lN] C^{t}[r] P C[\rho] h_{\mathcal{I}}[n+m-(l-r+\rho)N] \Bigg) + \mathrm{CC}\,. \end{aligned} \tag{114}$$

In order to obtain equation (114), statistically independent data with the same power in the real and the imaginary portion were assumed. P is a diagonal matrix whose elements match the power of the channels used

$$P = \operatorname{diag}\left\{\left[\sigma_{A_{u_1}}^2\ \sigma_{A_{u_2}}^2\ \cdots\ \sigma_{A_{u_U}}^2\right]\right\} \quad \text{with} \quad \sigma_{A_{u_i}}^2 = \mathrm{E}\{|A_{u_i}|^2\},\ \{u_1, u_2, \ldots, u_U\} = \mathcal{K}_{\mathcal{U}}\,. \tag{115}$$

(114) discloses the periodic nature of Rs[n, m], each n + pN yields the same result as n. To eliminate this periodicity, Rs[n, m] is taken the mean of over one period.

$$R_s[m] = \frac{1}{N}\sum_{n=0}^{N-1} R_s[n,m] \tag{116}$$

$$\begin{aligned}
&= \frac{1}{N}\sum_{n=0}^{N-1}\Bigg(\sum_{l=-\infty}^{\infty}\bigg(h_{\mathcal{U}}^{t}[n-lN]Ph_{\mathcal{U}}[n+m-lN] \\
&\quad + \sum_{r=0}^{R-1} h_{\mathcal{I}}^{t}[n-lN]C^{t}[r]Ph_{\mathcal{U}}[n+m-(l-r)N] \\
&\quad + \sum_{r=0}^{R-1} h_{\mathcal{U}}^{t}[n-lN]PC[r]h_{\mathcal{I}}[n+m-(l+r)N] \\
&\quad + \sum_{r=0}^{R-1}\sum_{\rho=0}^{R-1} h_{\mathcal{I}}^{t}[n-lN]C^{t}[r]PC[\rho]h_{\mathcal{I}}[n+m-(l-r+\rho)N]\bigg)\Bigg) + \mathrm{CC}
\end{aligned} \tag{117}$$

$$\begin{aligned}
&= \frac{1}{N}\sum_{n=0}^{N-1}\bigg(h_{\mathcal{U}}^{t}[n]Ph_{\mathcal{U}}[n+m] \\
&\quad + \sum_{r=0}^{R-1} h_{\mathcal{I}}^{t}[n]C^{t}[r]Ph_{\mathcal{U}}[n+m+rN] + \sum_{r=0}^{R-1} h_{\mathcal{U}}^{t}[n]PC[r]h_{\mathcal{I}}[n+m-rN] \\
&\quad + \sum_{r=0}^{R-1}\sum_{\rho=0}^{R-1} h_{\mathcal{I}}^{t}[n-lN]C^{t}[r]PC[\rho]h_{\mathcal{I}}[n+m+(r-\rho)N]\bigg) + \mathrm{CC}
\end{aligned}$$

(118)

Since $\mathbf{h}_u[n]$ and $\mathbf{h}_I[n]$ only have a support in the range $0 \leq n < N$, summation over 1 in equation (117) is reduced to the term for 1 = 0, whereas all the other terms are equal to zero.

The use of the discrete Fourier transformed on $R_s[m]$ yields the power density spectrum

$$S_s(e^{j\theta}) = \sum_{m=-\infty}^{\infty} R_s[m]e^{-j\theta m} \tag{119}$$

$$= \frac{1}{N}\sum_{m=-RN+1}^{RN-1}\Bigg(\sum_{n=0}^{N-1}\bigg(h_U^t[n]Ph_U[n+m]$$
$$+\sum_{r=0}^{R-1} h_I^t[n]C^t[r]Ph_U[n+m+rN] + \sum_{r=0}^{R-1} h_U^t[n]PC[r]h_I[n+m-rN]$$
$$+\sum_{r=0}^{R-1}\sum_{\rho=0}^{R-1} h_I^t[n-lN]C^t[r]PC[\rho]h_I[n+m+(r-\rho)N]\bigg) + \mathrm{CC}\Bigg)e^{-j\theta m} \tag{120}$$

Since $R_s[m]$ only differs from zero in the range -RN < m < RN, summation in the equation (120) only has to be carried out in a finite interval.

As we now have an expression for the power density spectrum $S_s(e^{j\theta})$, a criterion may now be formulated which is to be optimized with regard to the coefficients $C[r]$, r = 0, 1, ..., R-1. It is the object of the present invention to suppress the transmitted signal within the fade-out range. The criterion used for optimization according to the invention is the weighted integral of $S_s(e^{j\theta})$.

$$\psi_1(C[0], C[1], \ldots, C[R-1]) = \int_0^{2\pi} W(e^{j\theta})S_s(e^{j\theta})\, d\theta \tag{121}$$

$W(e^{j\theta})$ is the weighting function. When $W(e^{j\theta})$ is set to 1 or outside zero within the fade-out range, the equation (121) is the transmitted power within the fade-out ranges. This choice